

SEQUENCE LISTING

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<120> IDENTIFICATION OF CANDIDA ALBICANS ESSENTIAL FUNGAL
SPECIFIC GENES AND USE THEREOF IN ANTIFUNGAL DRUG
DISCOVERY

<130> 10182-015

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<150> PCT/CA00/00533
<151> 2000-05-05

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<170> PatentIn Ver. 2.1

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 Ile Asn Ile Phe Thr Ile Ala Ser Gly Gln Leu Tyr Glu Lys Leu Thr
 1140 1145 1150
 Ser Ile Met Ile Ala Ser Val Arg Lys His Asn Pro Ser Leu Thr Ile
 1155 1160 1165
 Lys Phe Trp Ile Leu Glu Asp Phe Val Thr Pro Gln Phe Lys His Leu
 1170 1175 1180
 Val Glu Leu Ile Ser Ile Lys Tyr Asn Val Glu Tyr Glu Phe Ile Ser
 1185 1190 1195 1200

Tyr Lys Trp Pro Asn Phe Leu Arg Lys Gln Lys Thr Lys Glu Arg Met
1205 1210 1215

Ile Trp Gly Tyr Lys Ile Leu Phe Leu Asp Val Leu Phe Pro Gln Asp
1220 1225 1230

Leu Asn Lys Ile Ile Phe Ile Asp Ala Asp Gln Ile Cys Arg Ala Asp
1235 1240 1245

Leu Thr Glu Leu Val Asn Met Asp Leu Glu Gly Ala Pro Tyr Gly Phe
1250 1255 1260

Thr Pro Met Cys Asp Ser Arg Glu Glu Met Glu Gly Phe Arg Phe Trp
1265 1270 1275 1280

Lys Glu Gly Tyr Trp Ser Asp Val Leu Lys Asp Asp Leu Lys Tyr His
1285 1290 1295

Ile Ser Ala Leu Phe Val Val Asp Leu Gln Lys Phe Arg Ser Ile Lys
1300 1305 1310

Ala Gly Asp Arg Leu Arg Ala His Tyr Gln Lys Leu Ser Ser Asp Pro
1315 1320 1325

Asn Ser Leu Ser Asn Leu Asp Gln Asp Leu Pro Asn Asn Met Gln Arg
1330 1335 1340

Leu Ile Lys Ile Phe Ser Leu Pro Gln Asn Trp Leu Trp Cys Glu Thr
1345 1350 1355 1360

Trp Cys Ser Asp Lys Ser Leu Glu Asp Ala Lys Met Ile Asp Leu Cys
1365 1370 1375

Asn Asn Pro Leu Thr Arg Glu Asn Lys Leu Asp Ala Ala Lys Arg Leu
1380 1385 1390

Ile Pro Glu Trp Ile Glu Tyr Glu Gln Glu Ile Glu Pro Leu Val Ser
1395 1400 1405

Leu Val Gln Asn Asn Thr Ala Lys Glu Val Val Gln Glu Ile Glu Ile
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aattaaacag tcactagtcc tcagtcctca gtccttagtt cttgggttctt aatattaaga 180
tnttccatgtt ttttttttta cccaagctat gaaaattatt tttgttgtct aacaactata 240
ataatattta ccagaaattg ctacaaatat aaataaataa ataaataaat ataattaaga 300
gtatatctcc ctttttggtt tttttttctt cccagccc atg tcc gat agt gaa agt 355
                               Met Ser Asp Ser Glu Ser
                               1           5

tat tat caa aat tca act act aat caa cct att cct aga tct gat gaa 403
Tyr Tyr Gln Asn Ser Thr Thr Asn Gln Pro Ile Pro Arg Ser Asp Glu
                               10           15           20

gta ttg gat gat cat aga aat caa atc act aat gat tgt gcc att agt 451
Val Leu Asp Asp His Arg Asn Gln Ile Thr Asn Asp Cys Ala Ile Ser
                               25           30           35

gat agt gaa gat gag ttg gaa tta aaa tca gaa tta gaa tca gaa gtt 499
Asp Ser Glu Asp Glu Leu Glu Leu Lys Ser Glu Leu Glu Ser Glu Val
                               40           45           50

gta aaa agc gaa aaa caa caa caa cat cat caa gag att aca tca gat 547
Val Lys Ser Glu Lys Gln Gln Gln His His Gln Glu Ile Thr Ser Asp
                               55           60           65           70

aat gct aaa cca ttg act cgt aaa tct ggt tct tca att aag aaa aaa 595
Asn Ala Lys Pro Leu Thr Arg Lys Ser Gly Ser Ser Ile Lys Lys Lys
                               75           80           85

tct aat ctt acc gat aaa gat aga att acc aac cct atg agt tta tct 643
Ser Asn Leu Thr Asp Lys Asp Arg Ile Thr Asn Pro Met Ser Leu Ser
                               90           95           100

ggt ggt gat gat act att aac agc ggt cac aaa aat cgt aat tat aac 691
Gly Gly Asp Asp Thr Ile Asn Ser Gly His Lys Asn Arg Asn Tyr Asn
                               105           110           115

atg agt tca tta cgt aaa gat ttt tat tta aaa gat aat act gac gac 739
Met Ser Ser Leu Arg Lys Asp Phe Tyr Leu Lys Asp Asn Thr Asp Asp
                               120           125           130

aat tct act aat aat cat act cat ctt gca att cca att cca att cca 787
Asn Ser Thr Asn Asn His Thr His Leu Ala Ile Pro Ile Pro Ile Pro
                               135           140           145           150
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Gln Leu Glu Asn Leu Pro Pro Leu Ile Lys Lys Lys Thr Ile Gly Arg	
170 175 180	
aat aat tct aat aat ttt gaa aat gat tta gtt agt ccc atg aca aaa	931
Asn Asn Ser Asn Asn Phe Glu Asn Asp Leu Val Ser Pro Met Thr Lys	
185 190 195	
atg aaa act aat gat agt gaa gat att act aat act agc acc act gct	979
Met Lys Thr Asn Asp Ser Glu Asp Ile Thr Asn Thr Ser Thr Thr Ala	
200 205 210	
aat cat atg aaa ctt ggt att ggt gct aca acc ctt ggt gtt gga act	1027
Asn His Met Lys Leu Gly Ile Gly Ala Thr Thr Leu Gly Val Gly Thr	
215 220 225 230	
ggt act acc gcc act gcc act gcc act gct gct gct ggt aga aga cca	1075
Gly Thr Thr Ala Thr Ala Thr Ala Thr Ala Ala Ala Gly Arg Arg Pro	
235 240 245	
tct cgt tca tct att gat agt gaa gct gat tct cat gca tca aga tca	1123
Ser Arg Ser Ser Ile Asp Ser Glu Ala Asp Ser His Ala Ser Arg Ser	
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tct caa gaa act gaa gaa gat gtt tgt ttt cct atg gtt ggt gat cat	1171
Ser Gln Glu Thr Glu Glu Asp Val Cys Phe Pro Met Val Gly Asp His	
265 270 275	
att aga gtt aat gga att gat ttt gat gaa att gat gaa ttt att aga	1219
Ile Arg Val Asn Gly Ile Asp Phe Asp Glu Ile Asp Glu Phe Ile Arg	
280 285 290	
gaa gaa aga gaa gaa gct tat tta caa aaa caa atg att gct aaa aat	1267
Glu Glu Arg Glu Glu Ala Tyr Leu Gln Lys Gln Met Ile Ala Lys Asn	
295 300 305 310	
att ctg cgt att gat gaa ttt caa aat ctt tcc aaa aat aat act act	1315
Ile Leu Arg Ile Asp Glu Phe Gln Asn Leu Ser Lys Asn Asn Thr Thr	
315 320 325	
agt ggt gca tct cgt cat cca tat cat cat cac agt aat aat aat aaa	1363
Ser Gly Ala Ser Arg His Pro Tyr His His His Ser Asn Asn Asn Lys	
330 335 340	
aaa aat aat ggt ggt gat ggt ggt ggt tct agt atg gca gca tta aaa	1411
Lys Asn Asn Gly Gly Asp Gly Gly Gly Ser Ser Met Ala Ala Leu Lys	
345 350 355	
tat act cca aaa aat att tta aag aaa aca tta tca aga ttt gaa ttt	1459
Tyr Thr Pro Lys Asn Ile Leu Lys Lys Thr Leu Ser Arg Phe Glu Phe	
360 365 370	

gtg att cat gga att gaa tat gaa gct gat gcc att gaa gat gcc gtt	2179
Val Ile His Gly Ile Glu Tyr Glu Ala Asp Ala Ile Glu Asp Ala Val	
600 605 610	
ttc act gct aga gat act gat ttt agt agt atg tta caa aga att ggt	2227
Phe Thr Ala Arg Asp Thr Asp Phe Ser Ser Met Leu Gln Arg Ile Gly	
615 620 625 630	
gaa tca aga aga aaa gtc atg act tta atg aga tta tta tca ggt aaa	2275
Glu Ser Arg Arg Lys Val Met Thr Leu Met Arg Leu Leu Ser Gly Lys	
635 640 645	
gct gat gtc att aaa atg ttt gct aaa aga tgt caa gaa gaa gct aat	2323
Ala Asp Val Ile Lys Met Phe Ala Lys Arg Cys Gln Glu Glu Ala Asn	
650 655 660	
tct tct tct ggt tat tat caa cgt caa tat aac tta caa caa caa caa	2371
Ser Ser Ser Gly Tyr Tyr Gln Arg Gln Tyr Asn Leu Gln Gln Gln Gln	
665 670 675	
caa cag gcc cca cca cca cca cct aat cct att att act tca cca att	2419
Gln Gln Ala Pro Pro Pro Pro Pro Asn Pro Ile Ile Thr Ser Pro Ile	
680 685 690	
aat tca act ttg aat ctt aat agt tta gga act tca act ggt gga gga	2467
Asn Ser Thr Leu Asn Leu Asn Ser Leu Gly Thr Ser Thr Gly Gly Gly	
695 700 705 710	
gta gga gta gga gga att aat ttt ggt ccc aat cca act gga aat aat	2515
Val Gly Val Gly Gly Ile Asn Phe Gly Pro Asn Pro Thr Gly Asn Asn	
715 720 725	
act aat act aat act aat act act ggt tca cct tca cca cct caa caa	2563
Thr Asn Thr Asn Thr Asn Thr Thr Gly Ser Pro Ser Pro Pro Gln Gln	
730 735 740	
caa caa caa cat ggt atc act aac aaa tct ttc ccc atc ccc gat gca	2611
Gln Gln Gln His Gly Ile Thr Asn Lys Ser Phe Pro Ile Pro Asp Ala	
745 750 755	
cgt cca aga gct gat att gca tta tat tta ggt gat att caa gat cat	2659
Arg Pro Arg Ala Asp Ile Ala Leu Tyr Leu Gly Asp Ile Gln Asp His	
760 765 770	
ata atc acc atg ttt caa aat tta tta gcc tat gaa aaa att ttc agt	2707
Ile Ile Thr Met Phe Gln Asn Leu Leu Ala Tyr Glu Lys Ile Phe Ser	
775 780 785 790	
cgt tca cat tca aat tat tta gct caa tta caa gtt gaa tca ttc aat	2755
Arg Ser His Ser Asn Tyr Leu Ala Gln Leu Gln Val Glu Ser Phe Asn	
795 800 805	
tcc aat aat aaa atc acc gaa atg ttt tct aaa att act ttg att ggg	2803
Ser Asn Asn Lys Ile Thr Glu Met Phe Ser Lys Ile Thr Leu Ile Gly	
810 815 820	

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 Thr Met Leu Val Pro Leu Asn Leu Val Thr Gly Leu Phe Gly Met Asn
 825 830 835

gta aga gtc cct ggt gaa ggt ggt acc aat tta ggt tgg ttt ttc gga 2899
 Val Arg Val Pro Gly Glu Gly Gly Thr Asn Leu Gly Trp Phe Phe Gly
 840 845 850

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 Ile Val Gly Val Leu Ile Phe Ile Ile Ile Gly Ser Phe Ile Phe Ala
 855 860 865 870

caa tgg tgg ttg aaa aaa ttg aat aat tca att gaa gga caa aat aat 2995
 Gln Trp Trp Leu Lys Lys Leu Asn Asn Ser Ile Glu Gly Gln Asn Asn
 875 880 885

ggt aat cga cca att ttt aat cat tca tca aga aga tca att aga agt 3043
 Gly Asn Arg Pro Ile Phe Asn His Ser Ser Arg Arg Ser Ile Arg Ser
 890 895 900

tta ggt tta aaa aaa cat ggt ggt aat aaa tca att att agt ttc ccc 3091
 Leu Gly Leu Lys Lys His Gly Gly Asn Lys Ser Ile Ile Ser Phe Pro
 905 910 915

aat aaa tat gaa taagaataat caaagaaatg ccacagagtt tgatggtttg 3143
 Asn Lys Tyr Glu
 920

tttttttttt ttttattgtc atgatggagt tgtatatata tataacttttt atagaagtaa 3203
 caatagtaaa tgataatagt agtcatcaat catcatatatt ataattgtat ataatcgtat 3263
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 cgagttgtgt taaattggag agtcaaatta ataggatgta aaagaagttt ttaaagaagg 3383
 aataaagaaa tattataatt cagangttca tacagaaggg gggggaagga gaaggggata 3443
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 Ile Pro Arg Ser Asp Glu Val Leu Asp Asp His Arg Asn Gln Ile Thr
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 Asn Asp Cys Ala Ile Ser Asp Ser Glu Asp Glu Leu Glu Leu Lys Ser
 35 40 45

$\frac{1}{n} \left(\frac{1}{m} + \frac{1}{m^2} + \frac{1}{m^3} + \dots + \frac{1}{m^{n-1}} \right) = \frac{1}{n} \left(\frac{1 - \frac{1}{m^n}}{1 - \frac{1}{m}} \right) = \frac{1}{n} \left(\frac{m^n - 1}{m^n(m-1)} \right)$

Ser Met Ala Ala Leu Lys Tyr Thr Pro Lys Asn Ile Leu Lys Lys Thr
355 360 365

Leu Ser Arg Phe Glu Phe Thr His Glu Asn Ser Ser Ser Ser Glu Glu
370 375 380

Ile Tyr Glu Leu Lys Thr Lys Gln Gln Pro Pro Tyr Lys Tyr Asp Asp
385 390 395 400

Gln Leu Ser Leu Thr Ser Ser Thr Ser Ser Thr Ser Gly Ser Gly Ser
405 410 415

Gly Gln Val Lys Phe Gly Gly Ala Arg Ile Ser Asp Gly Ile Asn Gly
420 425 430

Gly Ser Leu Pro Asp Arg Phe Ser Leu Phe His Ser Glu Ser Glu Glu
435 440 445

Thr Ile His Ala Pro Asp Ile Pro Ser Leu Val Ser Pro Gly Gln Ser
450 455 460

Val Arg Asp Leu Phe Arg Asn Gly Glu Glu Thr Trp Trp Leu Asp Cys
465 470 475 480

Thr Cys Pro Thr Asp Ser Glu Met Lys Met Leu Ala Lys Ala Phe Gly
485 490 495

Ile His Pro Leu Thr Ala Glu Asp Ile Arg Met Gln Glu Thr Arg Glu
500 505 510

Lys Val Glu Leu Phe Lys Ser Tyr Tyr Phe Val Cys Phe His Thr Phe
515 520 525

Glu Ala Asp Lys Glu Ser Glu Asp Tyr Leu Glu Pro Ile Asn Val Tyr
530 535 540

Ile Val Val Phe His Asp Gly Ile Leu Thr Phe His Phe Ser Pro Ile
545 550 555 560

Ser His Pro Ala Asn Val Arg Arg Arg Val Arg Gln Leu Arg Asp Tyr
565 570 575

Val Asp Val Ser Ala Asp Trp Leu Cys Tyr Ala Leu Ile Asp Glu Ile
580 585 590

Thr Asp Gly Phe Ala Pro Val Ile His Gly Ile Glu Tyr Glu Ala Asp
595 600 605

Ala Ile Glu Asp Ala Val Phe Thr Ala Arg Asp Thr Asp Phe Ser Ser
610 615 620

Met Leu Gln Arg Ile Gly Glu Ser Arg Arg Lys Val Met Thr Leu Met
625 630 635 640

Arg Leu Leu Ser Gly Lys Ala Asp Val Ile Lys Met Phe Ala Lys Arg
645 650 655

Cys Gln Glu Glu Ala Asn Ser Ser Ser Gly Tyr Tyr Gln Arg Gln Tyr
 660 665 670
 Asn Leu Gln Gln Gln Gln Gln Gln Ala Pro Pro Pro Pro Pro Asn Pro
 675 680 685
 Ile Ile Thr Ser Pro Ile Asn Ser Thr Leu Asn Leu Asn Ser Leu Gly
 690 695 700
 Thr Ser Thr Gly Gly Gly Val Gly Val Gly Gly Ile Asn Phe Gly Pro
 705 710 715 720
 Asn Pro Thr Gly Asn Asn Thr Asn Thr Asn Thr Asn Thr Thr Gly Ser
 725 730 735
 Pro Ser Pro Pro Gln Gln Gln Gln Gln His Gly Ile Thr Asn Lys Ser
 740 745 750
 Phe Pro Ile Pro Asp Ala Arg Pro Arg Ala Asp Ile Ala Leu Tyr Leu
 755 760 765
 Gly Asp Ile Gln Asp His Ile Ile Thr Met Phe Gln Asn Leu Leu Ala
 770 775 780
 Tyr Glu Lys Ile Phe Ser Arg Ser His Ser Asn Tyr Leu Ala Gln Leu
 785 790 795 800
 Gln Val Glu Ser Phe Asn Ser Asn Asn Lys Ile Thr Glu Met Phe Ser
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 Lys Ile Thr Leu Ile Gly Thr Met Leu Val Pro Leu Asn Leu Val Thr
 820 825 830
 Gly Leu Phe Gly Met Asn Val Arg Val Pro Gly Glu Gly Gly Thr Asn
 835 840 845
 Leu Gly Trp Phe Phe Gly Ile Val Gly Val Leu Ile Phe Ile Ile Ile
 850 855 860
 Gly Ser Phe Ile Phe Ala Gln Trp Trp Leu Lys Lys Leu Asn Asn Ser
 865 870 875 880
 Ile Glu Gly Gln Asn Asn Gly Asn Arg Pro Ile Phe Asn His Ser Ser
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<222> (2007)..(4538)

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ggcaaccag aaggaatttc tcaagctgaa tgggtgaaat tttatgaaaa tgggtggcaga 240
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catcattgga gaaaatacca tgctaatagat gatcctgatg tcaaaataaa acataaagaa 360
gatatcgaa atgagttggt acatcatcaa caagagattg aagagactca cgatagatcg 420
agtcgattga aaaaatttgc tgggtgattac tgggtcagaga tcaatatcga caatcttaaa 480
ccaaaatata gaaaacaaca gaaatagtga gaggttagta aagagaaacc ttaaaaaaca 540
ccaggaagcc aacncttagc ttggctatat agaagtagaa atagaaatca agatcaataa 600
aaagacgcac caacagcgct actactacta ctacattttg aaaacaattt gctgggaagt 660
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aagttcttgt attaaagata gaattcctct ctctctcaaa aagctgtcaa attgacacac 780
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aatttttggg ggatattgaa tcgtgttggt taaatacttt tgcctattc aattcagctt 1260
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aaagtttata tctgtctctt atataattta ccttatagtc aacttcactt cttcttttca 1380
ttccttgtag tctttgttac attttttgtt ctggttctct ttactaaca caacacaata 1440

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$$\frac{-x}{\sqrt{1-x^2}} = \frac{x}{\sqrt{1-x^2}} + \frac{-2x^3}{(1-x^2)^{\frac{3}{2}}} - \frac{6x^5}{(1-x^2)^{\frac{5}{2}}} + \dots$$

[Handwritten musical notation]

$$\frac{d}{dt} \left(\frac{\partial L}{\partial \dot{x}} \right) = \frac{\partial L}{\partial x}, \quad \frac{d}{dt} \left(\frac{\partial L}{\partial \dot{y}} \right) = \frac{\partial L}{\partial y}$$

tca ggt aga aag gaa agc ggc tca ttc act ttg aga tat cgt agt gaa 3857
Ser Gly Arg Lys Glu Ser Gly Ser Phe Thr Leu Arg Tyr Arg Ser Glu
605 610 615

gaa gcc aga aac caa tgg gaa aag tgt tta cgt gat ttg aag act aat 3905
Glu Ala Arg Asn Gln Trp Glu Lys Cys Leu Arg Asp Leu Lys Thr Asn
620 625 630

gaa atg aat aaa caa att cat aag aag tta cgt gat tcc gac ctg tca 3953
Glu Met Asn Lys Gln Ile His Lys Lys Leu Arg Asp Ser Asp Leu Ser
635 640 645

ttt aat act gat gac tct gcc ata tat gat tac acg ggt att agt acg 4001
Phe Asn Thr Asp Asp Ser Ala Ile Tyr Asp Tyr Thr Gly Ile Ser Thr
650 655 660 665

tca cca gtc aat caa tca act caa caa caa tac tat gat cat cgg ggc 4049
Ser Pro Val Asn Gln Ser Thr Gln Gln Gln Tyr Tyr Asp His Arg Gly
670 675 680

tct cac agt tcc cgc cat cac tca tcg tca tcc act ttg agt atg atg 4097
Ser His Ser Ser Arg His His Ser Ser Ser Thr Leu Ser Met Met
685 690 695

aag aat aat aga gtt aaa tct ggt gat ttg agt aga ata tct tca act 4145
Lys Asn Asn Arg Val Lys Ser Gly Asp Leu Ser Arg Ile Ser Ser Thr
700 705 710

tca aca aca tta gat tct ttc agt aac aac ttg aat ggg tca cca aat 4193
Ser Thr Thr Leu Asp Ser Phe Ser Asn Asn Leu Asn Gly Ser Pro Asn
715 720 725

acc act aat cca tct ttg acg tct tca gat gcc acc aaa aca att cca 4241
Thr Thr Asn Pro Ser Leu Thr Ser Ser Asp Ala Thr Lys Thr Ile Pro
730 735 740 745

aca ttt gac gtt gca att aaa ttg ctt tac aaa tcg aca gaa ttg tca 4289
Thr Phe Asp Val Ala Ile Lys Leu Leu Tyr Lys Ser Thr Glu Leu Ser
750 755 760

gag cca ttg att gtc aat gca caa att gag tat aat gac ctt tta cag 4337
Glu Pro Leu Ile Val Asn Ala Gln Ile Glu Tyr Asn Asp Leu Leu Gln
765 770 775

aaa att atc tcc cag att atc act tcg aac ttg gtg gct gat gat gtc 4385
Lys Ile Ile Ser Gln Ile Ile Thr Ser Asn Leu Val Ala Asp Asp Val
780 785 790

aat att agt cga ttg aga tat aaa gac gac gaa gga gac ttt gtg aat 4433
Asn Ile Ser Arg Leu Arg Tyr Lys Asp Asp Glu Gly Asp Phe Val Asn
795 800 805

ttg aat tca gat gat gat tgg ggg tta gtg ctt gat atg tta acc agt 4481
Leu Asn Ser Asp Asp Asp Trp Gly Leu Val Leu Asp Met Leu Thr Ser
810 815 820 825

gaa gac ttt tac caa aca tca agc aat gaa aaa cga ctg gtg aca gtg 4529
 Glu Asp Phe Tyr Gln Thr Ser Ser Asn Glu Lys Arg Leu Val Thr Val
 830 835 840

tgg gtt tct tgatttaact acaggaacaa acgctacctt tgtttggtgt 4578
 Trp Val Ser

gtgtgtgtat gtatgggtgc tttttttttt tatttcttga tgggtgtgtga ctttggaaga 4638

taaacaaatt aagagttaat gttttgctgt gcaaaataag ctggtataga tgggttcaat 4698

taatcaattt catatagata tataaatgac actttgacga aatatactat ttataaattt 4758

ccttttttct ttgttttgta agattaatgt tgggttctgt tgatgtgtcg gtacacccaaa 4818

cgcaataatt aaaatctagt aagacggtaa atgggtagat gagaaaaggt caatagagtt 4878

tattctaattg tgggtgcaaa tttaaaggcaa cagataaatt tggtaaacad tttctaaaac 4938

gtattgccgc ttccagagtc aaaaaaaaga ataaagctaa tatattagt ctaataatag 4998

tagtaataca aaacaagggt tcaaagtttt cgctcaaaac atcaagccat tgcttatata 5058

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ca 5300

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<212> PRT

<213> Candida albicans

<400> 6

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 20 25 30

Leu Gly Pro Val Asn Ile Asn Asn Phe Asn Lys Pro Ser Thr Pro Lys
 35 40 45

Asp His Leu Phe Tyr Arg Cys Glu Ser Leu Lys Arg Lys Leu Gln Lys
 50 55 60

Ile Pro Gly Met Glu Pro Phe Leu Asn Gln Ala Phe Asn Gln Ala Glu
 65 70 75 80

Gln Leu Ser Glu Gln Gln Ala Leu Ala Leu Ala Gln Glu Arg Ser Asn
 85 90 95

Gly Asn Gly His Ser Asn Gly Lys Arg His Gln Ser Leu Asp Gly Ala
100 105 110

Met Asn Arg Leu Ser Val Gly Ser Asp Ser Ser Ser Ile Gln Gly Ser
115 120 125

Leu Thr Arg Met Ala Thr Asn Ala Ser Thr Ser Ser Leu Ile Ser Gly
130 135 140

Met Pro Asn Ser Asn Thr Leu Phe Thr Phe Thr Ala Gly Val Leu Pro
145 150 155 160

Ala Asn Ile Ser Val Asp Pro Ala Thr His Leu Trp Lys Leu Phe Gln
165 170 175

Gln Gly Ala Pro Phe Cys Val Leu Ile Asn His Ile Leu Pro Asp Ser
180 185 190

Gln Ile Pro Val Val Ser Ser Asp Asp Leu Arg Ile Cys Lys Lys Ser
195 200 205

Val Tyr Asp Phe Leu Ile Ala Val Lys Thr Gln Leu Asn Phe Asp Asp
210 215 220

Glu Asn Met Phe Thr Ile Ser Asn Val Phe Ser Asp Asn Ala Gln Asp
225 230 235 240

Leu Ile Lys Ile Ile Asp Val Ile Asn Lys Leu Leu Ala Glu Tyr Ser
245 250 255

Asp Ala Ser Asp Leu Gly Gly Gly Asp Glu Asp Val Asn Met Asp Val
260 265 270

Gln Ile Thr Asp Glu Arg Ser Lys Val Phe Arg Glu Ile Ile Glu Thr
275 280 285

Glu Arg Lys Tyr Val Gln Asp Leu Glu Leu Met Cys Lys Tyr Arg Gln
290 295 300

Asp Leu Ile Glu Ala Glu Asn Leu Ser Ser Glu Gln Ile His Leu Leu
305 310 315 320

Phe Pro Asn Leu Asn Glu Ile Ile Asp Phe Gln Arg Arg Phe Leu Asn
325 330 335

Gly Leu Glu Cys Asn Ile Asn Val Pro Ile Arg Tyr Gln Arg Ile Gly
340 345 350

Ser Val Phe Ile His Ala Ser Leu Gly Pro Phe Asn Ala Tyr Glu Pro
355 360 365

Trp Thr Ile Gly Gln Leu Thr Ala Ile Asp Leu Ile Asn Lys Glu Ala
370 375 380

Ala Asn Leu Lys Lys Ser Ser Ser Leu Leu Asp Pro Gly Phe Glu Leu
385 390 395 400

Gln Ser Tyr Ile Leu Lys Pro Ile Gln Arg Leu Cys Lys Tyr Pro Leu
405 410 415

Leu Leu Lys Glu Leu Ile Lys Thr Ser Pro Glu Tyr Ser Lys Gln Asp
420 425 430

Pro His Gly Ser Ser Ser Leu Thr Ser Phe Asn Glu Leu Leu Val Ala
435 440 445

Lys Thr Ala Met Lys Glu Leu Ala Asn Gln Val Asn Glu Ala Gln Arg
450 455 460

Arg Ala Glu Asn Ile Glu His Leu Glu Lys Leu Lys Glu Arg Val Gly
465 470 475 480

Asn Trp Arg Gly Phe Asn Leu Asp Ala Gln Gly Glu Leu Leu Phe His
485 490 495

Gly Gln Val Gly Val Lys Asp Ala Glu Asn Glu Lys Glu Tyr Val Ala
500 505 510

Tyr Leu Phe Glu Lys Ile Val Phe Phe Phe Thr Glu Ile Asp Asp Asn
515 520 525

Lys Lys Ser Asp Lys Gln Glu Lys Lys Ser Lys Phe Ser Thr Arg Lys
530 535 540

Arg Ser Thr Ser Ser Asn Leu Ser Ser Ser Thr Thr Asn Leu Leu Glu
545 550 555 560

Ser Ile Asn Asn Ser Arg Lys Asp Asn Thr Leu Pro Leu Glu Leu Lys
565 570 575

Gly Arg Val Tyr Ile Ser Glu Ile Tyr Asn Ile Ser Ala Pro Asn Thr
580 585 590

Pro Gly Ser Thr Leu Ile Ile Ser Trp Ser Gly Arg Lys Glu Ser Gly
595 600 605

Ser Phe Thr Leu Arg Tyr Arg Ser Glu Glu Ala Arg Asn Gln Trp Glu
610 615 620

Lys Cys Leu Arg Asp Leu Lys Thr Asn Glu Met Asn Lys Gln Ile His
625 630 635 640

Lys Lys Leu Arg Asp Ser Asp Leu Ser Phe Asn Thr Asp Asp Ser Ala
645 650 655

Ile Tyr Asp Tyr Thr Gly Ile Ser Thr Ser Pro Val Asn Gln Ser Thr
660 665 670

Gln Gln Gln Tyr Tyr Asp His Arg Gly Ser His Ser Ser Arg His His
675 680 685

Ser Ser Ser Ser Thr Leu Ser Met Met Lys Asn Asn Arg Val Lys Ser
690 695 700

Gly Asp Leu Ser Arg Ile Ser Ser Thr Ser Thr Thr Leu Asp Ser Phe
 705 710 715 720
 Ser Asn Asn Leu Asn Gly Ser Pro Asn Thr Thr Asn Pro Ser Leu Thr
 725 730 735
 Ser Ser Asp Ala Thr Lys Thr Ile Pro Thr Phe Asp Val Ala Ile Lys
 740 745 750
 Leu Leu Tyr Lys Ser Thr Glu Leu Ser Glu Pro Leu Ile Val Asn Ala
 755 760 765
 Gln Ile Glu Tyr Asn Asp Leu Leu Gln Lys Ile Ile Ser Gln Ile Ile
 770 775 780
 Thr Ser Asn Leu Val Ala Asp Asp Val Asn Ile Ser Arg Leu Arg Tyr
 785 790 795 800
 Lys Asp Asp Glu Gly Asp Phe Val Asn Leu Asn Ser Asp Asp Asp Trp
 805 810 815
 Gly Leu Val Leu Asp Met Leu Thr Ser Glu Asp Phe Tyr Gln Thr Ser
 820 825 830
 Ser Asn Glu Lys Arg Leu Val Thr Val Trp Val Ser
 835 840